GCC Datacenter Emergency Power Off System Test Instructions

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Introduction

This document provides instructions for testing the Emergency Power Off Systems (EPO Systems) installed in GCC Computer Rooms B and C. This test procedure is designed to verify the correct functionality of both the manual EPO system, and the automatic over-temperature EPO systems, while minimizing the chances of an accidental trip of the EPO system during the test.

The EPO system installed includes both a manual system which is triggered when either of two EPO switches are pressed, and two automated systems that trip when the room temperature exceeds a preset limit. The manual system features a switch located near each door to the computer room. The two automated systems are configured as a primary system and a backup system. The primary system is an active system with eight temperature sensors located in the warm isles of each computer room. The sensors feed a SiteLink I/O interface module that is programmed to power the shunt-trip coils in the main circuit breakers if a preset number of sensors report temperatures exceeding a set point. The set point and number of sensors needed to trip are configurable remotely through SiteScan. Temperatures measured by this device can also be monitored and logged remotely as well.

The backup system is a thermal relay device with a manually adjustable set point. This relay is an electromechanical device with no remote monitoring or control capabilities. In a normally functioning system, the primary overtemperature EPO system will be programmed with a temperature set point lower than that of the secondary system. Should the primary system fail to detect the over-temperature condition and shut down computer room power, then the backup system will, once its temperature setpoint is reached.

Local Control Panels

Control Panels for the EPO systems are located in computer rooms B and C. The panels control the systems installed in that room. The control panel contains the SiteLink interface controller as well as the EPO relays, EPO indicator lights, and lockout key switches (see Figure 1).

Figure 1 GCC Computer Room ECO Control Panel

The three indicator lights are defined as follows:

- Manual Release -- When lit, indicates that one of the manual EPO switches is closed, or the backup automatic over-temperature system is tripped. If this indicator is on, the indicator lights in the manual EPO switches should also be lit. If both the Manual Lockout and Shunts Lockout key switches are in the Normal position, the shunt trips will be powered, and computer room power will be interrupted.
- Auto Sys Release -- When lit, indicates that the primary Over-temperature EPO system has tripped. To trip, the primary system must detect a number of its eight sensors reporting temperatures exceeding their setpoints. The number of sensors needed to trip an EPO, and the temperature setpoints are programmable through SiteScan. If both the Auto Sys Lockout and Shunts Lockout key switches are in the Normal position, the shunt trips will be powered, and computer room power will be interrupted.
- Shunts Tripped -- When lit, indicates that one of the three EPO systems has tripped. If the Shunts Lockout key switch is in the Normal position, the shunt trips will be powered, and computer room power will be interrupted.

The three key switches are defined as follows:

- Manual Lockout -- When in the Normal position, the manual EPO switches and the secondary automatic Over-temperature EPO system are enabled. When in the Off position, these systems are disabled. *Note 1: This switch may only be switched into the Off position during an EPO system test. Switch must remain in the Normal position at all other times. Note 2: The Shunts Lockout switch must also be in the Normal position for the Manual EPO system to function.*
- Auto Sys Lockout -- When in the Normal position, the primary automatic Over-temperature EPO system is enabled. When in the Off position, the primary automatic Over-temperature EPO system is disabled. *Note 1: This switch may only be switched into the Off position during an EPO system test. Switch must remain in the Normal position at all other times. Note 2: The Shunts Lockout switch must also be in the Normal position for the automatic Over-temperature EPO system to function.*
- Shunts Lockout -- When in the Normal position, the EPO system is enabled, and power will be delivered to the shunt trips if any of the three EPO systems trips. *Note 1: The Manual Lockout key switch must be in the Normal position for the Manual EPO switches and the backup automatic Over-temperature EPO system to function, and the Auto Sys Lockout switch must be in the Normal position for the primary automatic Over-temperature EPO system to function. Note 2: The Shunts Lockout switch may only be switched into the Off position during an EPO system test. Switch must remain in the Normal position at all other times.*

EPO System Test Procedure

All three EPO sub-systems can be tested without actually powering down the computer room. This is accomplished by temporarily disabling the shunt trip coils using the Shunts Lockout key switch. When the Shunts Lockout key switch is in the Off position, the three EPO sub-systems can be tested. The procedure below should be executed on an annual basis in each computer room to verify that all three EPO sub-systems are functioning properly. Any negative result in the test procedure should be investigated and any necessary repairs executed as soon as possible.

Note: Remember that the computer room EPO system is disabled whenever the Shunts Lockout key switch is in the Off position. The test procedure below should be performed only when adequate time exists to complete the procedure. The key switches should never be left in the Off position while the room is unattended. Persons executing the test should be ready to perform a manual power off of the computer room should an emergency arise during the test. If an emergency occurs during the test procedure, and an emergency computer room power down is needed, simply halt the test at any point, switch all key switches to their Normal positions, and press either of the EPO switches located near one of the computer room doors.

Test Proceedure:

1. Action: Insert the Shunts Lockout key and switch the key switch to the Off position. Note that THIS KEY SHOULD REMAIN IN THE OFF POSITION FOR THE DURATION OF THE TEST. Use tape or a tag if necessary to prevent this key from being accidentally turned.
2. Action: Insert the Auto Sys Lockout key and switch the key switch to the Off position.
3. Action: Insert the Manual Lockout key and switch the key switch to the Off position.
4. Verify: Log onto SiteScan and observe the displayed positions of the switches and the state of the EPO relays. All should read as being off.
5. Action: After ensuring that all key switches are correctly positioned, press and release each of the two manual EPO switches located near the doors of the computer room in turn.
6. Verify: While either of the two manual switches is pressed, the Manual Release indicator light should be on, as well as the indicator lights in the manual switches themselves. The state of the manual EPO SiteScan indicator should match that of the panel indicator.
7. Action: Ensure that both manual EPO switches are in the off (out) position.
8. Action: Using a trouble light with an incandescent bulb as a heat source, apply heat to the thermal bulb of the Secondary Over-temperature EPO thermal relay. The thermal bulb must be in very close proximity to the light bulb. It is acceptable if the two are touching.
9. Verify: Once the trip temperature is reached, the Manual Release indicator light will turn on. Check that the manual EPO indicator is reported correctly in the SiteScan display.
10. Action: Remove the heat source from the thermal bulb and allow the device to cool.
11. Verify: The Manual Release indicator light will turn off. The state of the indicator in SiteScan should match that of the panel indicator.
12. Action: Switch the Manual Lockout key switch to the Normal position. Do not change the position of the other switches.
13. Verify: The Manual Lockout key switch position should be reported in the Normal position by SiteScan.
14. Action: Repeat steps 5 through 11.
15. Verify: Results should be the same as described in steps 6 and 9, except that the Shunts Tripped indicator should also be on whenever a manual EPO switch is pressed, or when the thermal switch is on.
16. Action: Position the Manual Lockout switch into the Off position.
17. Verify: The switch position should be reported to be Off in SiteScan.
18. Action: Ensure that the Shunts Lockout switch is still in the Off position.
19. Action: Using a trouble light with an incandescent bulb as a heat source, apply heat to one of the sensors in the primary sensor array. The trouble light can be hung from the conduit clamp provided for this purpose. The sensor should be in very close proximity to the light bulb. It is acceptable if the two are touching.
20. Verify: Observe the temperature reported in SiteScan. Check that the correct sensor is reporting the increased temperature. Once the trip temperature is reached, SiteScan should report an over-temperature trip, but it should not signal for a computer room shutdown with just one sensor tripped.
21. Action: Remove the heat source from the temperature sensor and allow the device to cool.
22. Verify: Check that SiteScan reports the correct temperature.

23. Action: Repeat steps 19 and 20 for all eight sensors in the primary system
24. Action: Apply heat to N different sensors at the same time, where N is the number of sensors needed to trip a computer room EPO.
25. Verify: When all N sensors have tripped, the Auto Sys Release indicator should come on. Verify that SiteScan reports the correct sensors tripped, and that an EPO event has been tripped.
26. Action: Remove the heat sources from the sensors and allow them to cool.
27. Verify: The panel indicators are all off. SiteScan reports all sensors at normal temperature, and the system is not in EPO.
28. Action: Position the Auto Sys Lockout switch into the Normal position.
29. Verify: SiteScan reports this switch to be in the Normal position.
30. Action: Repeat steps 24 through 27.
31. Verify: The Auto Sys Release and Shunts Tripped indicators should both light when tripped.
32. Verify: All indicators are off. SiteScan reports all temperatures normal and no EPO condition exists. The Manual Lockout and the Shunts Lockout switches are in the Off position.
33. Action: Position the Manual Lockout switch into the Normal position.
34. Action: Position the Shunts Lockout switch into the Normal position.
35. Action: Remove keys from key switches.
36. Verify: Panel indicators are off and switches are all in Normal position.
37. Verify: SiteScan reports all switches in the Normal position. SiteScan reports all temperatures in the normal range, and no EPO condition exists.
38. System is armed and functioning normally.

EPO System Schematic